United States Environmental Protection Agency

# EPA Community-Focused Exposure and Risk Screening Tool: C-FERST

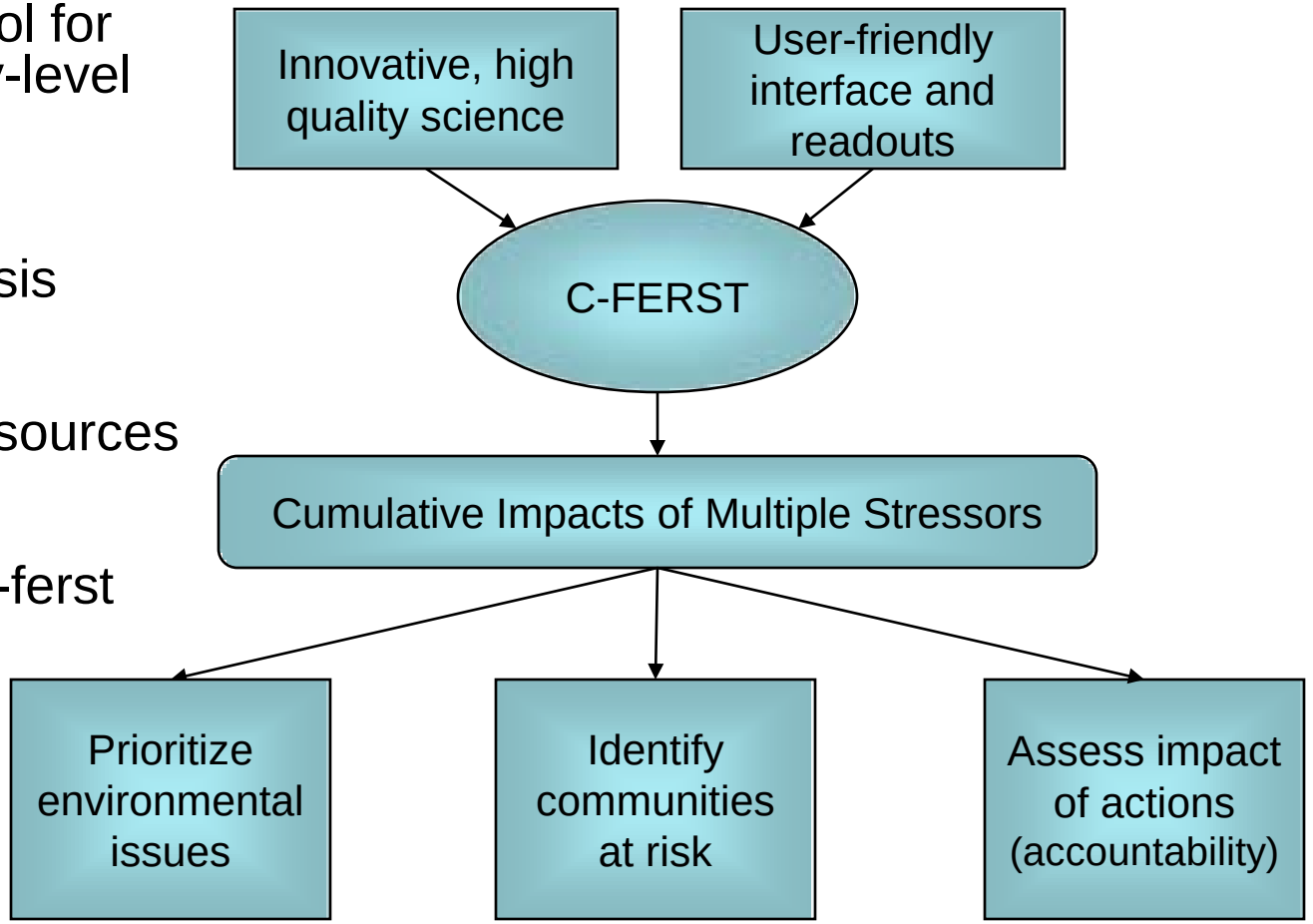
*NIEHS PEPH Program Meeting*
*April 27, 2010*



SCIENCE

# What Is C-FERST?
## Community-Focused Exposure and Risk Screening Tool

- One-stop shop web tool for conducting community-level assessments
- GIS display and analysis
- Access to available resources
- www.epa.gov/heasd/c-ferst



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## Background

1. Development of Communities & Cumulative Risk Research Program (Zartarian and Schultz, 2008)
2. Review of publicly available EPA tools (Barzyk et al., 2008)
3. Overview of measurement methods (Medina-Vera et al., 2008)
4. Development of C-FERST (2008-present)
5. Further development of methods and resources (2008-present)
6. Subsequent Annual Performance Measures (i.e., Agency milestones)
   - Development and application of C-FERST (2010)
   - Application and assessment of tools in communities (2011)

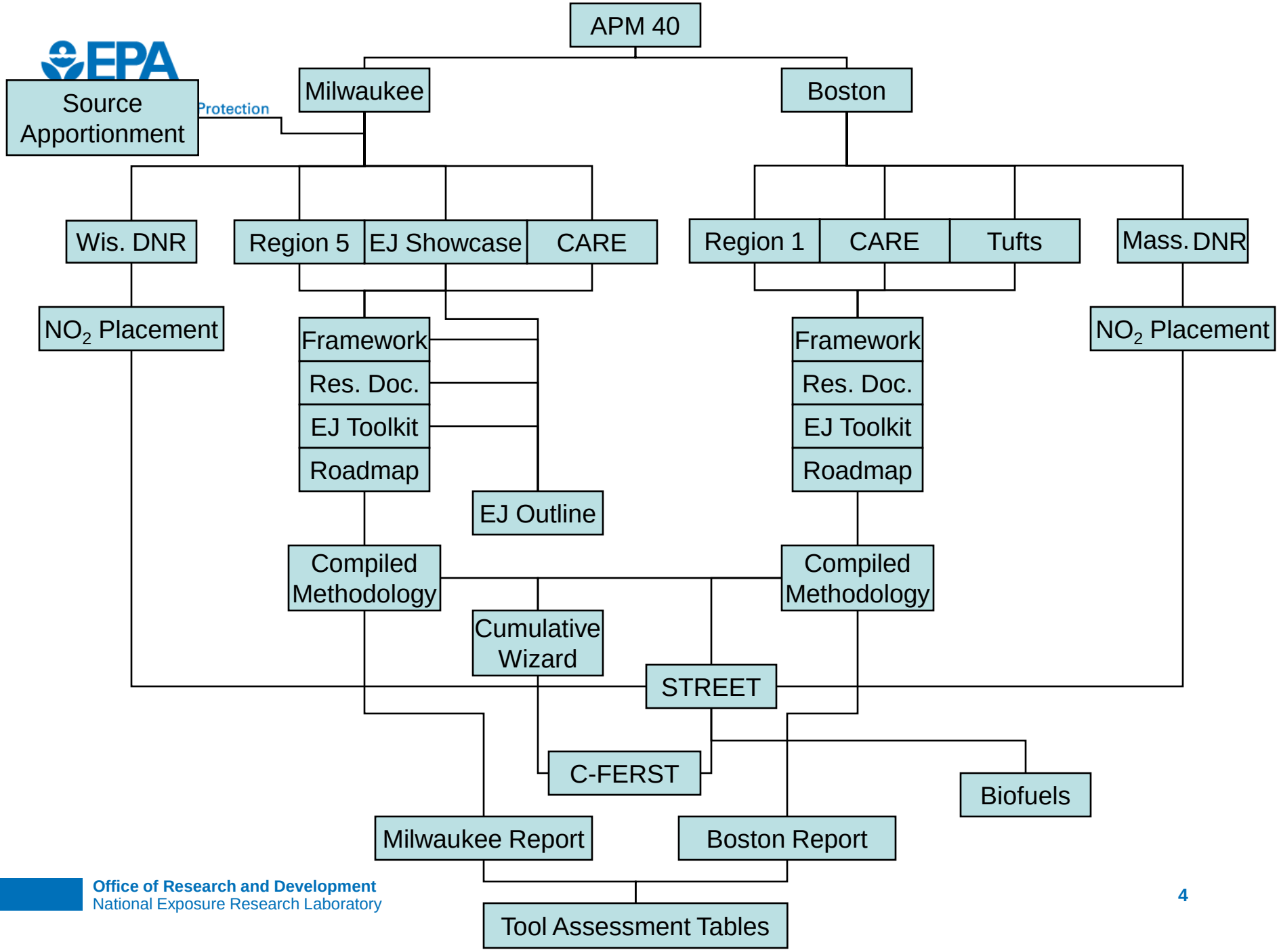
# Needs & Impacts

## Needs

- Understand environmental issues in context of risk
- Develop EPA tools using best available information
- EJ communities could have higher risks and limited access to resources

## Impacts

- Enhance access to information and methods to reduce reliance on risk perception
- Empower regions and communities with a localized exposure assessment tool based on sound science to make informed cost-effective decisions and take action
- Improve public health by facilitating informed decisions about “at risk” or “hot spot” communities
- Provide information to develop solutions


APM 40
Milwaukee
Boston
Source Apportionment
Protection
Wis. DNR
Region 5
EJ Showcase
CARE
Region 1
CARE
Tufts
Mass. DNR
$NO_2$ Placement
Framework
Res. Doc.
EJ Toolkit
Roadmap
EJ Outline
Framework
Res. Doc.
EJ Toolkit
Roadmap
$NO_2$ Placement
Compiled Methodology
Compiled Methodology
Cumulative Wizard
STREET
C-FERST
Biofuels
Milwaukee Report
Boston Report
Tool Assessment Tables

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## Goal of Case Studies

### How

- Apply tools
- Assess tools

### Where

- In specific geographic areas for specific populations
- In a cumulative exposure framework

### Why

- To support regional community efforts, such as
- CARE, Environmental Justice, Enforcement Targeting
- Local-scale community efforts, Identifying communities at risk
- To develop state-of-the-science tools like C-FERST

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## Current Projected Timeline

- C-FERST Intranet version 1 (June 2010)
  - Internal EPA testing and use
  - Guidance, web links, fact sheets, interactive maps for air toxics (NATA)

- C-FERST Extranet version 1 (December 2010?)
  - Beta testing by communities, academia, other Federal Agencies
  - Internet with password protection for limited public access
  - Inclusion of additional issues (e.g., radon) and data layers

- C-FERST Internet version 1 and beyond for public use (2011→)
  - Maps for additional issues (e.g., drinking water, lead, fish consumption)
  - Links to tools, incorporation of cumulative risk research (e.g., non-chemical stressors)
  - Ability to upload or link to locally collected data
  - Applications for community case studies
  - Blog/Wiki to facilitate sharing results

# Environmental Issues in C-FERST (FY10-12)

## Issues with fact sheets and science for exposure/risk maps

- air toxics
- arsenic in food, drinking water, soil
- diesel PM
- environmental tobacco smoke (ETS)
- fine particulates
- lead (multimedia)
- mercury in fish
- near roadway
- ozone
- radon
- residential pesticides
- ultraviolet radiation

## Issues with fact sheets only

- autobody shops
- brownfields
- E. Coli at beaches
- hazardous waste/pharmaceuticals
- healthy homes
- methamphetamine labs
- microbials in drinking water
- land use/smart growth
- lead in drinking water
- mold
- recreational water quality
- runoff
- schools
- solid waste disposal/recycling

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me » C-FERST » Guidance » EPA's Cumulative Risk Guidance Document

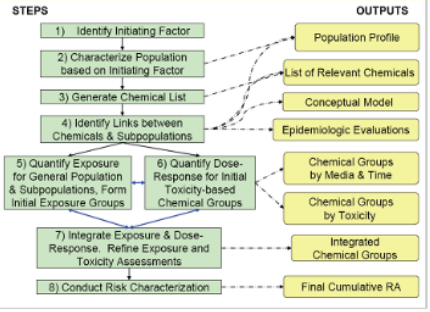
# 'A's Cumulative Risk Guidance Document with C-FERST

- View Exposure & Risk Maps
- View Environmental Issue Profiles
- Rank the Selected Issues
- Explore Potential Solutions
- CARE Roadmap with C-FERST
- PACE-EH with C-FERST
- EPA Cumulative Risk Guidance with C-FERST
- EPA EJ Toolkit with C-FERST
- Other Community Tools
- C-FERST Questions/Feedback

**nitiating Factor:** Determine whether your assessment is driven alth endpoint or increases in illnesses in the population, b) chemical concentrations in humans or the environment, or c) ollutant sources within the community.

... -FERST you can...

Source: EPA's Framework for Cumulative Risk Assessment Concepts, Methods and Data Sources for Cumulative Health Risk Assessment of Multiple Chemicals, Exposures and Effects: A Resource Document (412pp, 15.3MB, About PDF)




2. **Characterize Population based on Initiating Factor:** Provide a physical description of the study area and a demographic description of the population in that study area. These descriptions may be further refined as the investigation progresses.

   +In C-FERST you can...

3. **Generate Chemical List:** Develop a list of relevant chemicals by evaluating information on chemical releases, biomonitoring data, public health information, and environmental concentrations. This initial list of relevant chemicals is likely to be closely tied to the initiating factor.

   −In C-FERST you can...

   view a list of chemicals and their fact sheets that are relevant to specific initiating factors or generate Environmental Issue Profiles for chemicals of concern. These C-FERST profile reports contain available information (fact sheets, weblinks, maps) for each selected environmental issue and report category: General information, Health outcomes, Exposure and risk reductions, Population affected, Sources, Environmental Concentrations, Human Exposures, Health risks (cumulative where possible), Other Communities Focusing on this Issue, and Solutions Implemented by Other Communities.

   See also information from the EPA Offices of:
   - Water: http://www.epa.gov/ow/
   - Pesticide Programs: http://www.epa.gov/opp00001/
   - Solid Waste and Emergency Response: http://www.epa.gov/swerrims/
   - Air Quality Planning and Standards: http://www.epa.gov/air/oaqps/

4. **Identify Links between Chemicals and Subpopulations:** Identify the population groups which, because of either higher exposure or increased vulnerability, are particularly sensitive to the chemicals of interest. Occupational, dietary, or other exposure sources to toxicologically-similar chemicals may exist for some population subgroups; community involvement is important for the identification of such factors. A conceptual map may be useful for this step and would include the sources, chemicals, exposure pathways, exposure routes, subpopulations and health endpoints to be analyzed.

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5. **Quantify Exposure for General Population & Subpopulations:** Using the previously defined population and study area, identify all existing and future completed pathways. Exposure modeling may be helpful here; useful tools for this step include monitoring data for chemical concentrations and information from epidemiologic studies or public health databases. It will be useful to include relevant exposure factors, including those unique factors which cause differential exposures for sensitive subpopulations.

6. **Form Initial Exposure Groups:** Simplify the gathered information by grouping the chemicals according to a) timing of exposure (both duration and intermittency) and b) either medium or pathway.

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7. **Quantify Dose-Response for Initial Toxicity-based Chemical Groups:** Using the initial exposure groups formed in 5, evaluate the groups in terms of toxicological timing factors: toxicological overlap of internal dose, kinetics interactions, toxicodynamic interactions, and persistence of effects. Keep in mind that both simultaneous and sequential exposures may exhibit joint toxicity. Any issues that cannot be quantified may be described qualitatively.

8. **Integrate Exposure & Dose-Response. Refine Exposure and Toxicity Assessments:** Determine whether any of the toxicity overlaps (i.e. interactions) match up with the exposure overlaps. If so, exposure information for these chemicals may need to be improved. The products of this step are refined exposure and toxicity characteristics and the resulting risk estimates.

9. **Conduct Risk Characterization:** Perform a technical integrative analysis to produce risk estimates. Using the results of this analysis, state recommendations and uncertainties in a risk characterization summary.

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# Community-Focused Exposure and Risk Screening Tool

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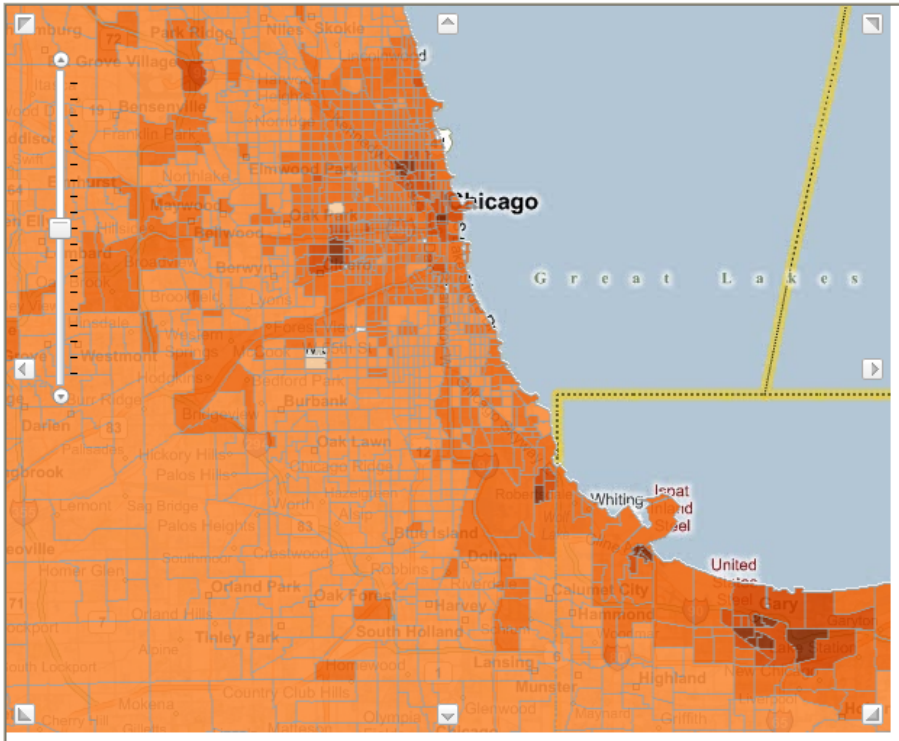



Start Over  Previous Extent

Next Extent

Please enter a city, county, zip code, or addres

United States  Locate

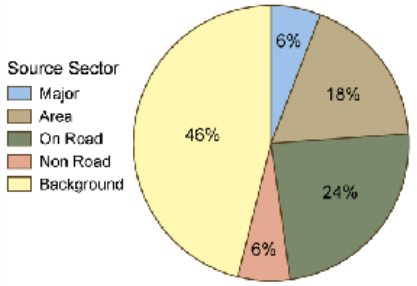
Environmental Issues

Data References

**Charts**

This pane will hold dynamically generated charts. Below is a static sample of what such a chart will look like.

2002 NATA Benzene Cancer Risk
for census tract 569794
(101 in a million)




Click once on a census tract for a breakdown of risk by source sector.

Additional Map Layers

This site is a work in progress, disclaimers about the data belong here.

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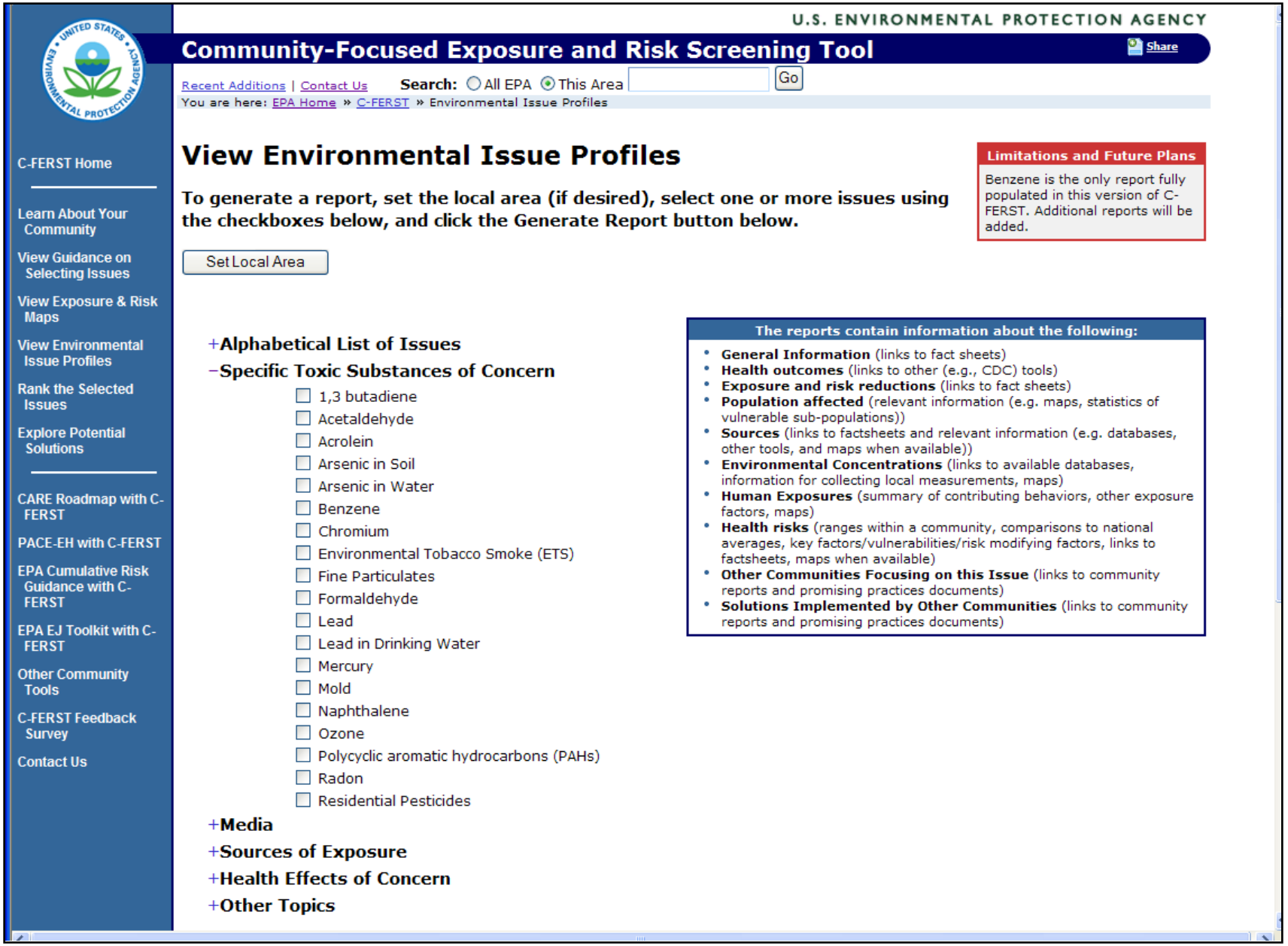
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View Environmental Issue Profiles
To generate a report, set the local area (if desired), select one or more issues using the checkboxes below, and click the Generate Report button below.
Set Local Area
Limitations and Future Plans
Benzene is the only report fully populated in this version of C-FERST. Additional reports will be added.
+Alphabetical List of Issues
−Specific Toxic Substances of Concern
1,3 butadiene
Acetaldehyde
Acrolein
Arsenic in Soil
Arsenic in Water
Benzene
Chromium
Environmental Tobacco Smoke (ETS)
Fine Particulates
Formaldehyde
Lead
Lead in Drinking Water
Mercury
Mold
Naphthalene
Ozone
Polycyclic aromatic hydrocarbons (PAHs)
Radon
Residential Pesticides
+Media
+Sources of Exposure
+Health Effects of Concern
+Other Topics
The reports contain information about the following:
General Information (links to fact sheets)
Health outcomes (links to other (e.g., CDC) tools)
Exposure and risk reductions (links to fact sheets)
Population affected (relevant information (e.g. maps, statistics of vulnerable sub-populations))
Sources (links to factsheets and relevant information (e.g. databases, other tools, and maps when available))
Environmental Concentrations (links to available databases, information for collecting local measurements, maps)
Human Exposures (summary of contributing behaviors, other exposure factors, maps)
Health risks (ranges within a community, comparisons to national averages, key factors/vulnerabilities/risk modifying factors, links to factsheets, maps when available)
Other Communities Focusing on this Issue (links to community reports and promising practices documents)
Solutions Implemented by Other Communities (links to community reports and promising practices documents)


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LOCATION
This is located in Zip Code 48209 (Detroit, Wayne County, MI)
ISSUE
Benzene
GENERAL INFORMATION
For more information on this issue, go to: EPA's Office of Air and Radiation
Relevant Web Links:Care Resource Guide References:
CARE Resource Guide (key word search: Air Pollution)
EPA's OPPT Community Assistance Program (CAP)
EPA's Office of Pollution Prevention and Toxics
Additional External Links:
Safety and Health Topics: Benzene (Occupational Safety and Health Administration) EXIT Disclaimer
Facts About Benzene (CDC) | PDF version (4pp, 316KB, About PDF) EXIT Disclaimer
Benzene: ToxFAQs (ATSDR) (PDF) (2pp, 30KB, About PDF) EXIT Disclaimer
HEALTH OUTCOMES
Under Development: This will include summary bullets, and links to other tools.
EXPOSURE AND RISK REDUCTION ACTIONS
Relevant Web Links:Care Resource Guide References:
Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI)
Additional External Links:
Benzene: ToxFAQs (ATSDR) (PDF) (2pp, 30KB, About PDF) EXIT Disclaimer
SCALE (POPULATION AFFECTED)
Under Development: Will provide a summary of vulnerable sub-populations.
SOURCES
Relevant Web Links:Care Resource Guide References:
EPA's Technology Transfer Network: Air Toxics Website
EPA's High Production Volume Challenge Program
Additional EPA Links:
Air Toxics Risk Assessment Reference Library, Volume 1, Chapter 4, Air Toxics: Chemicals, Sources, and Emissions Inventories (PDF) (32pp, 1MB, About PDF)
National Air Toxics Assessment (NATA) Website
EPA's Toxic Air Pollutant Website
Additional External Links:
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Upload and map local data

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## Potential Overlap with NIEHS PEPH Program

- Assess applicability of C-FERST across the wide range of community projects
- Identify utility of exposure assessments within context of community goals
- Determine strengths and weaknesses of the tool – information or methodological gaps e.g.
- Cross-check levels of information required to make decisions

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## Acknowledgments


- C-FERST Development Team in ORD NERL
- ORD Management for C-FERST Support
- C-FERST Development Contractors (Alion Science and Technology, Inc. and CSC) and National Computing Center
- C-FERST Collaborators in ORD, CARE (e.g., R1, R5, R7, R9), and Region 1 (e.g., GIS team)

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## Disclaimer

Although this work was reviewed by EPA and approved for presentation, it may not necessarily reflect official Agency policy.